

Release and Evaluation of *Diorhabda elongata*, a Eurasian Leaf Beetle, for Biological Control of Saltcedar.

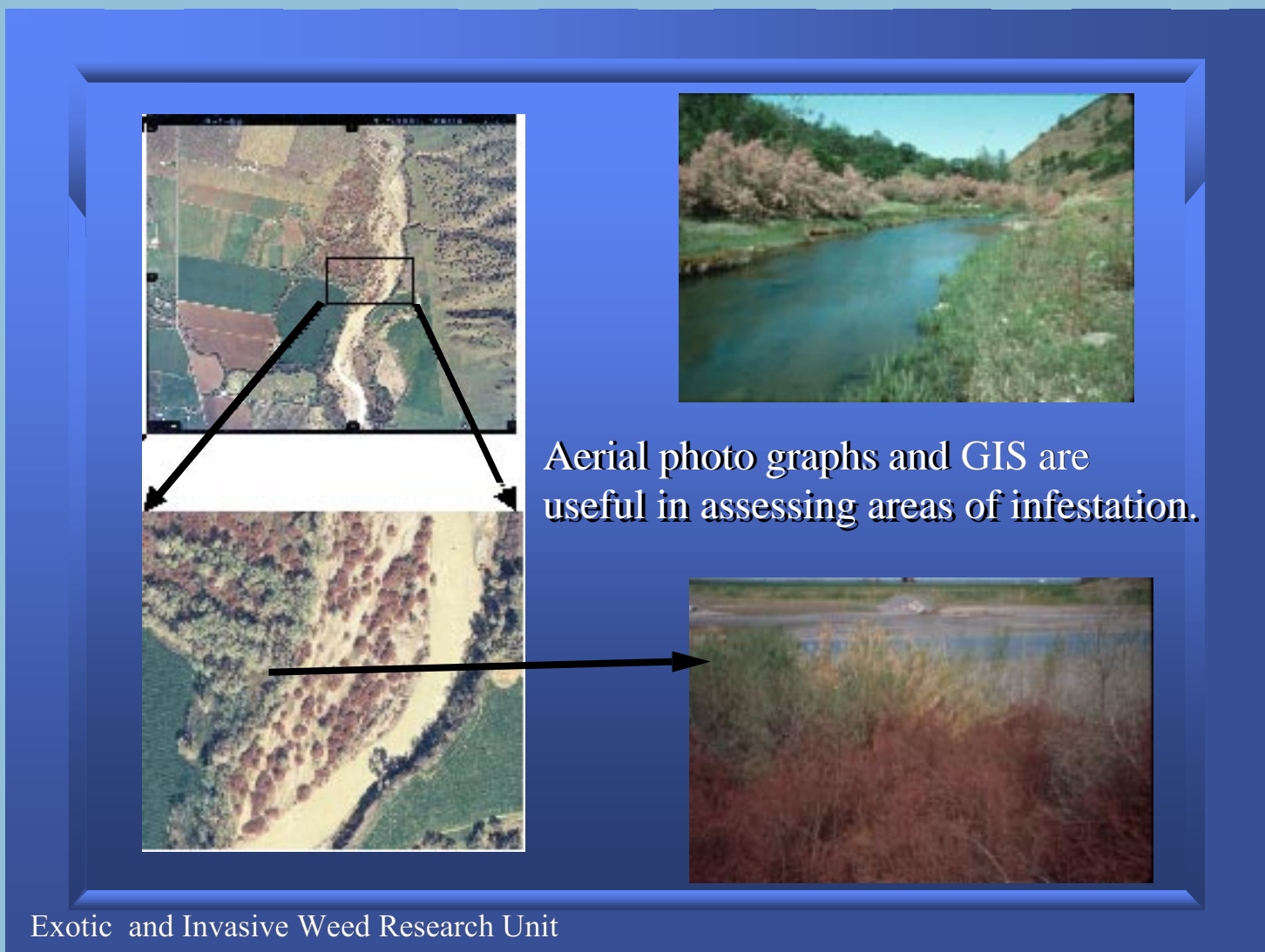
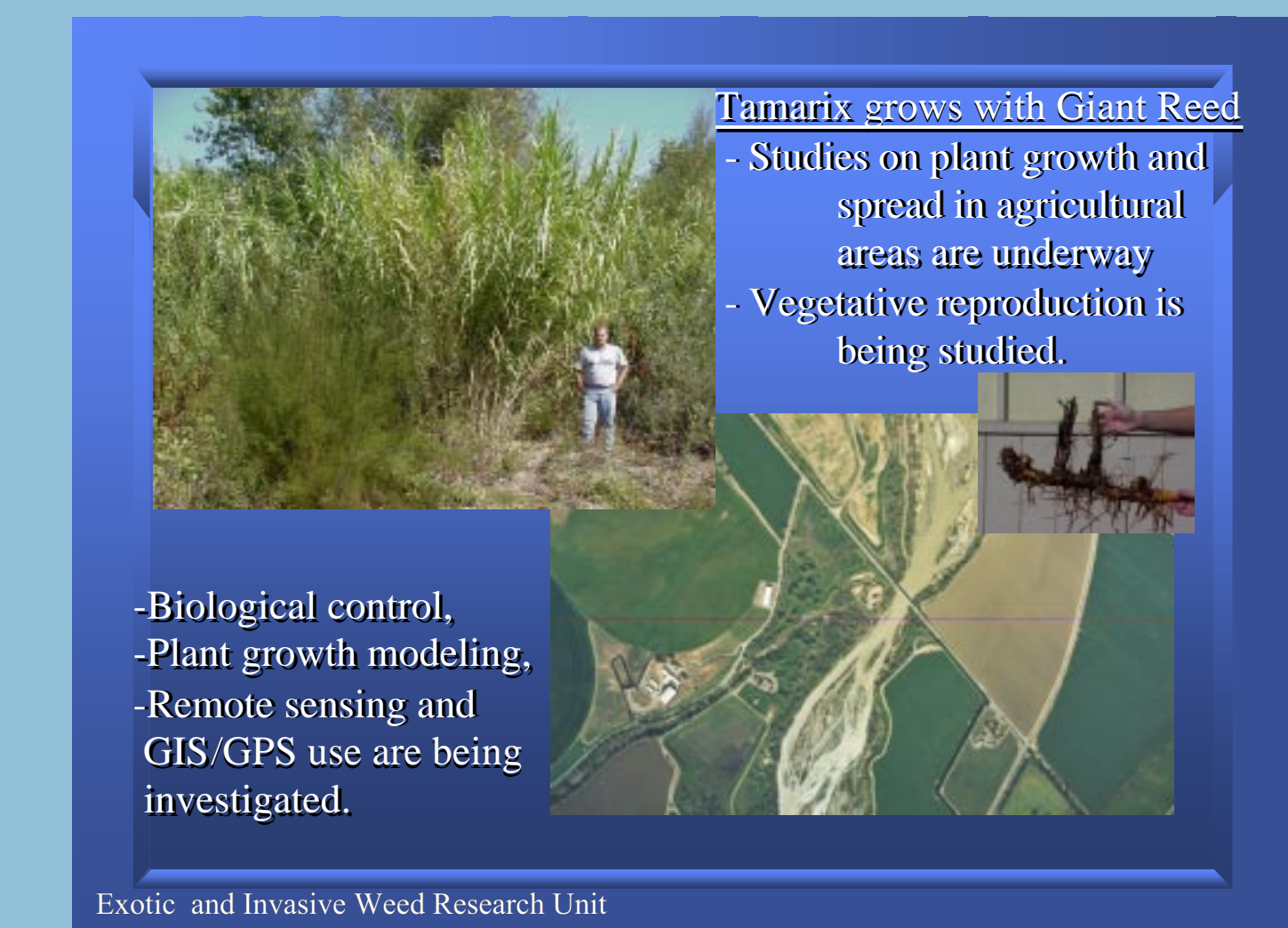
The USDA has initiated a biological control implementation program for the exotic plant saltcedar. Emphasis has been placed on locating and testing host-specific natural enemies that feed on *Tamarix ramosissima* and *T. parviflora*. In Eurasia, insect herbivores are known to exert extensive pressure on *Tamarix* spp. and are thought to limit plant growth and reproduction. Over 200 different herbivores attack saltcedar in the areas where these plants are native. These native populations rarely reach pest status and never totally dominate riparian habitats.

Saltcedar, *Tamarix* spp., is an exotic shrub to small tree that has invaded approximately 1.2 million acres of riparian habitat across the western US from California to the central Great Plains and from northern Mexico to Montana. It is estimated to have caused \$16 billion in damage over the past 50 years.



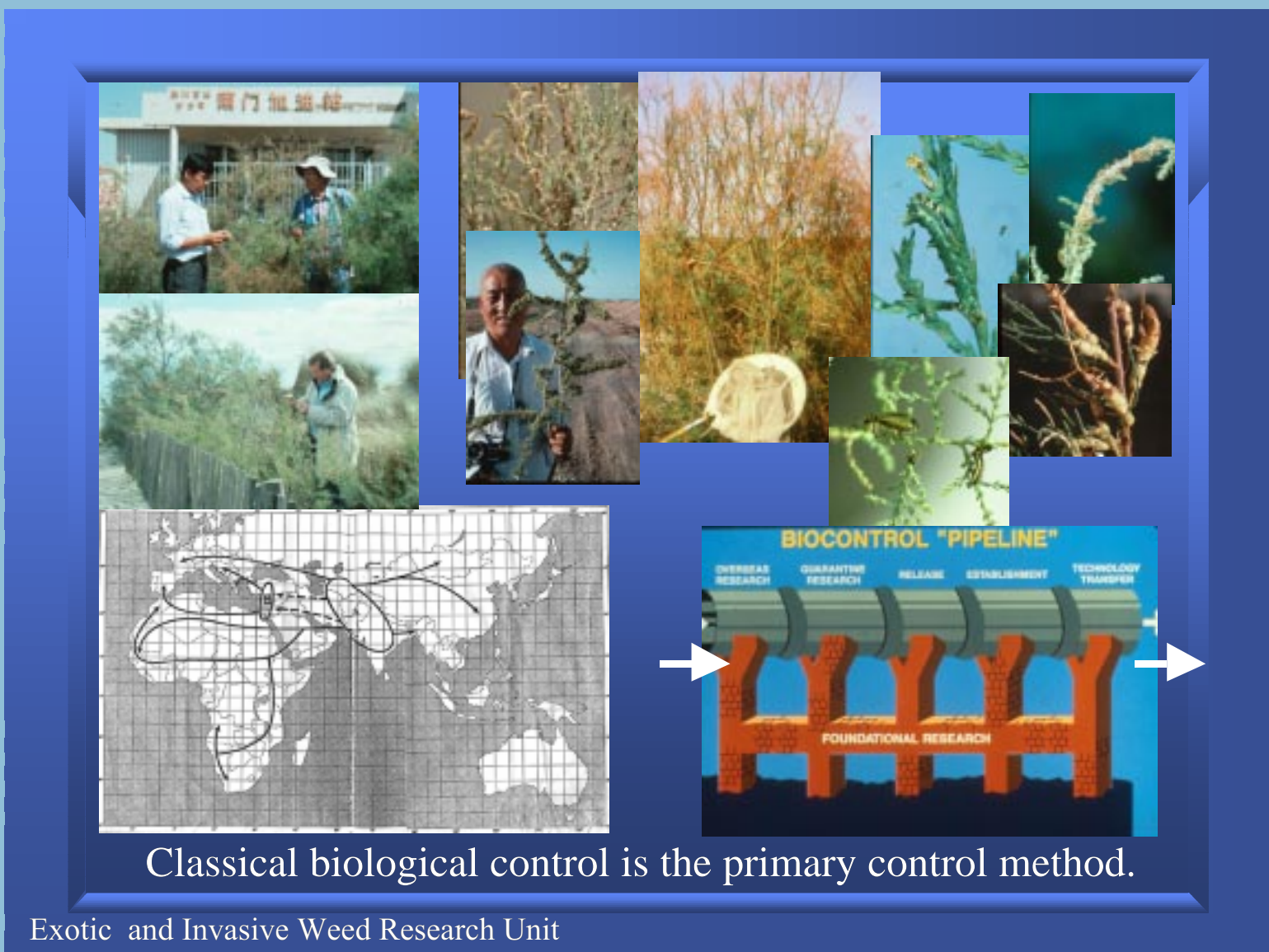
In the United States, both *T. ramosissima* and *T. parviflora* have shown invasive tendencies, often form monotypic stands, and cause extensive damage through a variety of harmful effects that damage many native plants and animals. Some of the invasive potential of saltcedar is thought to be due to its better adaptation to altered hydrological patterns and other human controlled factors. However, the lack of herbivory has been suggested as one of the most significant reasons that saltcedar is so

Tamarix parviflora and *Arundo donax* grow intermixed at one of our primary research sites near Davis, CA. The unit is currently attempting to address invasive weed issues and control them on a landscape scale using a combination of field, laboratory and computer simulation/ GIS/ GPS technologies.

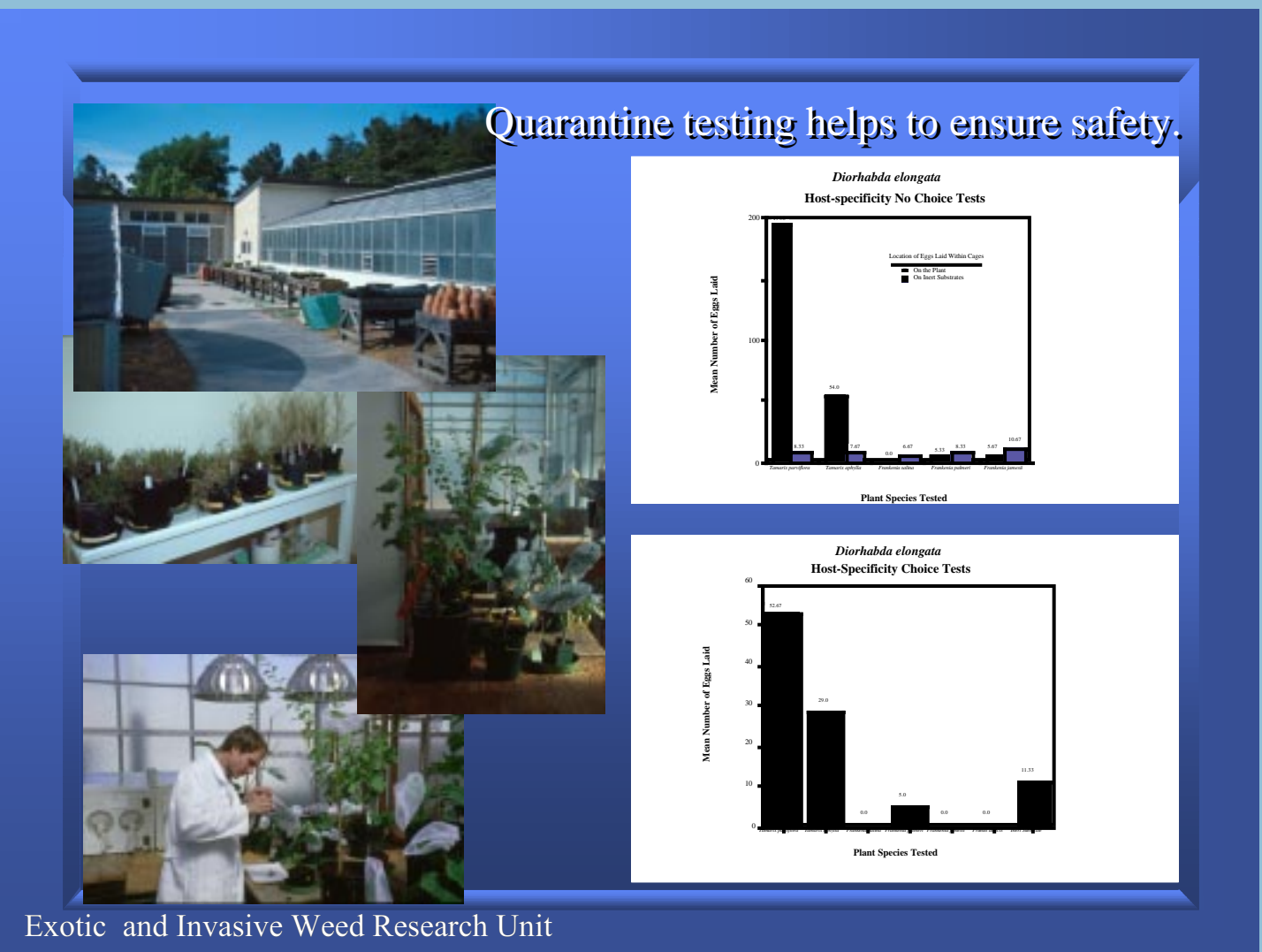


This research effort on *Tamarix* biology and control is an excellent example project where several groups are working cooperatively on one major problem area. Scientists, land managers and a number of other public and private groups have formed a Consortium to help develop and implement *Tamarix* biological control and revegetation efforts.

invasive and often out competes native species. Currently, only a single insect species (an accidentally introduced leafhopper) is found in any significant numbers feeding on saltcedar. In the USDA program, approximately 30 different insect natural enemies are considered to be appropriate biological control agents. A single insect, the *Tamarix* leafbeetle (*Diorhabda elongata*) has been cleared for release by both the US Fish and Wildlife Service and the USDA Animal and Plant Health Inspection Service. Experimental cage releases are now underway in six western states.



Saltcedar originated in Eurasia from where it was introduced into the United States in the early 1800s. To study its natural enemies, ARS scientists have cooperated with a large number of researchers in over 10 different countries. Studies have identified over 200 insect natural enemies that feed on saltcedar in its homeland. Several of those insects have been studied in detail and are now being permitted for release into the North American environment to help control this pest plant using biological control.



R. Carruthers¹, J. DeLoach², J. Herr¹, P. Lewis², T. Dudley³, J. Gould⁴ and N. Carruthers⁴

¹ USDA-ARS, Albany, CA; ² USDA-ARS, Temple, TX, ³ Univ. of California, Berkeley, ⁴ USDA-APHIS, Phoenix, AZ

It is hoped that this biological control program will help reduce saltcedar invasiveness and thus populations to below pest level status in the United States. We postulate that this reduction will allow native species to recover in many areas and thus benefit many other threatened and endangered species and agriculture production.



The first steps in our outdoor evaluations are tests conducted in large field cages. Studies of this type have been completed in six western states in cooperation with the Saltcedar Consortium. The Consortium has just been funded for \$3 million through a USDA grant that will allow this research to be expanded to a larger scale and then implemented over extensive areas.

To date, beetles have been released into field cages in California, Colorado, Nevada, Texas, Utah and Wyoming. In most of these sites, the beetles have successfully survived the winter months and emerged in the spring of the year to cause major defoliation of the test saltcedar plants. In test cages in California, Colorado and Nevada, the beetles caused total defoliation of the saltcedar plants by mid summer. We are currently monitoring these plants to determine their regrowth potential and loss of reproductive capacity. Additional research continues on testing these and other agents that may be released at some future date.

The cage studies have shown that the *Diorhabda elongata* leaf beetles from China are able to successfully establish in US conditions. In fact, in several of the release areas they increased 10-25 fold in a single generation and caused complete defoliation of the caged saltcedar plants. Research is now continuing within the cages to determine the long term impact on the *Tamarix*.

